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(54) Benevnelse **BOTTLE FOR PACKAGING LIQUID**

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A BOTTLE FOR PACKAGING LIQUID

The invention concerns a liquid dispensing bottle and, more particularly, a dispensing bottle equipped with a pump system to initiate dispensing of the liquid.

5 The invention is particularly suitable for ophthalmic dropper bottles, but it is understood that it can be applied to the dispensing of any type of liquid.

10 In this type of bottle, a known pumping mechanism is used which is actuated by pressing a movable part thereof. In order to design a bottle with optimal ergonomics which is easy to grasp and operate by applying the necessary pressure to the movable piston, it is known in the art to use a cover cap to help actuate the piston and therefore the pump. Said cover cap comprises a cylindrical part that covers at least part of the liquid receiving reservoir of the bottle,
15 and has, at the top, a plane upper face with a central bore which the dispenser tip can pass through. When the cover cap is positioned on the bottle, the upper face rests on the pump piston. This increases the size of the area that must be pressed to actuate the pump and makes it easier to operate in the long term.

20 Different variants of cover caps can be used with the bottle to facilitate actuation of the pump, such as that claimed in patent WO 2010/139883 filed by the Applicant, which describes a cover cap consisting of two parts designed to slide towards each other parallel to the axis of the pump and which each have a thumb tab that
25 further facilitates actuation of the two parts of the pump system.

30 Liquid dispensing bottles are commonly used to dispense eye lotion or other eye care substances. It is common, particularly due to the number of bottles sold together in the same box, for several bottles to be available to the user at the same time, yet it is important that they are not all open at the same time, but rather one after the other. As an example, it may be recommended storing the bottles, which are filled under sterile conditions, at a certain temperature before opening and, once they are open, storing them

for several weeks at ambient temperature. When carrying out the invention, it therefore seemed advisable to improve the dispensing bottles such as they are described above so that their previous use can be clearly identified since, once a bottle has been used for the first time, it can only be kept for a prescribed period of time.

In this context, the present invention concerns a liquid dispensing bottle comprising a cover cap providing a simple, effective way of informing the user that the bottle is being used for the first time.

In this respect, the invention concerns a bottle to contain a liquid comprising a liquid receiving reservoir (2) with a distribution head mounted thereon, which distribution head comprises an axially movable piston portion in a pump system for pumping the liquid out and a dispenser tip which moves solid with said piston and through which said liquid is discharged said movable piston portion having a flange with an upper face on which said dispenser tip is attached. According to the features of the invention, a cover cap is formed on the one hand by a sleeve covering the piston designed to actuate the pump and on the other hand by a removable part that covers the bottle. The cover sleeve forms a cylindrical side wall whose upper end is extended by a transversal wall designed to rest on said upper face of the flange and which has a central bore to allow the dispenser tip to pass through, while said removable cover part is attached to the transversal wall of the sleeve by retaining means which are broken the first time the bottle is used. In this way, the removable cover part covers the central bore, which is opposite the side wall, when it is fixed to said transversal wall of the sleeve, and the central bore and dispenser tip are uncovered when the removable part is set aside after breaking the retaining means.

Thus, the user can easily see if the bottle concerned has already been opened, by visual observation of whether or not the means retaining the removable part have been broken. This prevents the user from opening all the bottles at the same time as a result of which each of the bottles can be kept according to the recommendations for use.

When the sleeve covers the piston flange, the transversal wall is designed to rest against the upper face of the flange and the central bore allows the dispenser tip to pass through. Furthermore, a cover cap not only indicates whether the bottle has been used, but
5 also actuates the pump via a part that covers the piston flange.

According to a feature of the invention, binding pins are placed on the inside face of the side wall so that the flange is imprisoned between said binding pins and the transversal wall. Thus, the cover cap cannot be removed from the bottle without
10 intentional action on the part of the user. The cover cap is left in place on the bottle and only the removable part can be removed. It is thus ensured that the indication that the bottle has been used will depend on the presence or absence of the removable part, or whether or not the retaining means have been broken.

In the preferred embodiments of the invention, the
15 transversal part of the sleeve is extended radially by a tab which extends towards the outside of the sleeve, and the cylindrical side wall of said sleeve extends axially to cover the flange and at least part of the liquid reservoir. Advantageously, said side wall of the
20 cover sleeve extends axially along the reservoir under said tab. The tab is designed to facilitate the axial thrust on the sleeve in order to actuate the pump piston, and the side wall is designed to facilitate sliding of said sleeve along the bottle, with its preferred position under the tab reducing the tilting effect and friction that can be
25 caused by the sleeve sliding along the bottle.

According to a feature of the invention, means are provided to prevent the cover cap from rotating in relation to the bottle, in order to secure the relative angular position of the cover cap. In
said secured angular position of the cover cap, the side wall of the
30 cover sleeve extends along the reservoir, under the tab, and on the side of the bottle opposite the side reserved for labelling.

Thus, the removable part is designed to cover the dispenser tip. Said removable part is made solid with the transversal wall by retaining pins that can be broken by rotating the removable

part in relation to the sleeve when using the bottle for the first time. Advantageously, said pins are placed transversally between the end of the removable part and the rim of the central bore, in the plane of the flange. Their arrangement in the extension of the flange
5 therefore makes it easier to demold the assembly.

The removable cover part can then have a conical shape that is complementary to that of the dispenser tip in order to cover said tip, and it can have blisters on the inside of the wall delimiting said conical form. Thus, the inside cross-section of the removable
10 part is reduced to enable the removable part of the dispenser tip or a cap added to said tip beforehand to be clipped into place, when the cover is placed in position. Handling and removal of the cap is thus facilitated by using the removable part to grasp the cap.

According to the features of the invention, the conical tip
15 forming the removable part of the cover cap can be in the shape of a cone truncated at the end opposite the transversal wall of the sleeve, to allow the cap to pass through. The conical portion has axial stiffening ribs on the outside to make it easier for the user to maintain a grip and exert action.

This type of removable part positioned above the
20 transversal wall is interesting for a particular embodiment of the invention in which the cover sleeve has two parts that slide along each other. An upper part covers the movable piston portion to actuate the pump and a lower part covers the bottom of the
25 reservoir, and both parts are prevented from rotating one with respect to the other. The pump is actuated by the two parts moving towards each other, and the two parts each have a radial tab so that the bottle can be easily grasped in order to produce said movement. When the user wishes to break the retaining means when using the
30 bottle for the first time, the cover sleeve is prevented from rotating in relation to the torque applied to the piston, regardless of where it is grasped by the user. If the user holds the upper part, it is easy to break the retaining means. If, on the other hand, the user holds the lower part, the upper part is prevented from rotating by the

combined action of the user's grasp and the means used to prevent the two parts from rotating with respect to each other.

The invention also concerns a process to manufacture a bottle to contain a liquid in which, under sterile conditions, a reservoir is first filled with liquid after which said reservoir is assembled with a distribution head comprising a pump system, an axial piston to actuate the system, a dispenser tip that is displaced along with the movable piston portion and through which the liquid is discharged, and a cap that covers the tip. According to the process, in a second step, and under conditions that are not necessarily sterile, a cover cap is formed by a sleeve covering said movable piston portion to actuate the pump and a removable part fixed to said sleeve by breakable retaining means, with said removable part placed so that it covers the cap placed on the distribution head. Thus, the assembly can be manufactured and mounted in different locations while respecting the sterile manufacturing requirements. The cover cap can be mounted at the end of the process under non-sterile conditions, after the bottle has been filled and sealed hermetically by the cap under sterile conditions.

For this purpose, the cover cap has an inside dimension such that it can cover the dispenser tip when the tip is already covered with its own cap. Implementation of the device is thus facilitated while respecting the sterile conditions required for using an eye drop dispensing bottle, without, however, requiring sterile conditions during manufacture and implementation of the thumb-press tab. The bottle with its dispenser tip and cap can be produced under sterile conditions and the bottle can be subsequently equipped with the cover cap that covers the tip cap.

The invention and the resulting advantages will be described in detail in the embodiments below, based on the following figures:

- figure 1 is an exploded perspective view of a bottle to contain a liquid, equipped with a cover cap used to indicate when

the bottle has been opened, according to a first embodiment of the invention;

- figure 2 is a view of the bottle illustrated in figure 1 assembled and in cross-section;

5 - figure 3 is a perspective view of a bottle to contain a liquid, equipped with a cover cap used to indicate when the bottle has been opened, according to a second embodiment of the invention;

- figure 4 is a front view of a bottle according to a third
10 embodiment of the invention;

- figure 5 is a side view of the bottle illustrated in figure 4;

- figure 6 is a perspective view of a first element forming the cover cap equipping the bottle illustrated in figures 4 and 5; and

15 - figure 7 is a perspective view of a second element forming the cover cap equipping the bottle illustrated in figures 4 and 5.

As illustrated in the figures, the bottle to contain a liquid according to the invention comprises a reservoir 2, a distribution
20 head 4 mounted on the reservoir, and a cover cap 6.

The reservoir has a side wall 8 which is more or less cylindrical in shape, and a bottom wall 10. The liquid to be dispensed in the form of drops is stored in the reservoir and discharged via the distribution head.

25 For this purpose, the distribution head has a pumping device and a dispenser tip 12 placed on the outlet of the pumping device, so that the liquid taken from the reservoir by the pumping device will pass through the tip via a central canal that is not depicted, to a terminal liquid dispensing orifice 14. In the visible
30 part of the pumping device depicted in the figures, there is a piston 16 designed to move axially with respect to the reservoir in order to create negative pressure and draw up the liquid. The movable piston portion is displaced by exerting axial pressure on a flange 18 which

is part of the movable piston portion. The flange, which has a diameter at least equal to that of the reservoir, is extended axially by the dispenser tip through which the drops are dispensed.

The cover cap has a cover sleeve 20, a removable cover part 22 and retaining means 24 designed to be broken and release the removable part so it can be moved away from the sleeve.

The retaining means are formed here by breakable pins 25 (depicted in figure 2), designed so that they are initially solid with the removable part and the cover sleeve and can subsequently be separated by breaking of the pins as the result of rotation by the user.

The cover sleeve 20 has a cylindrically-shaped side wall 26, one axial end of which is extended transversally to the centre of the sleeve to form a transversal wall 28, which has a central bore 30. The cover sleeve is open at the other opposite end.

When the sleeve is positioned on the bottle, the transversal wall 28 rests on the upper face of the flange 18. Said transversal wall increases the bearing surface available to the user to apply pressure to the flange. A radial tab 32, which makes it easier to grasp the cover cap, radially extends said transversal wall towards the outside of the sleeve, by further increasing the available bearing surface. Advantageously, the tab is curved to facilitate the position of the user's thumb.

The side wall of the cover sleeve extends axially to cover the movable piston portion and at least part of the reservoir when the sleeve is positioned on the bottle. A variant (not depicted) could be developed so that the side wall extends axially in a non-uniform manner around the bottle and an axial clearance enables an information label glued to the reservoir to be read easily. The bottle can then include means to prevent the cover cap from rotating in relation to the bottle to ensure that, when the cover cap is locked in the angular position, the label is not covered and is therefore visible. In such a variant, it will be ensured that the side wall of the

cover sleeve which does not comprise the clearance, that is, the most extensive, will be located along the reservoir under the tab.

The cover cap has binding pins 34 on the inside of said side wall of said sleeve so that the flange is imprisoned between said binding pins and the transversal wall of the cover cap. As
5 illustrated in figure 2, said binding pins can take the form of an inclined plane reducing the inside diameter of the sleeve so that when the sleeve is inserted over the bottle, the flange slides into a locked position between the transversal wall and the right shoulder
10 of the binding pins formed at the end of the inclined plane.

The removable cover part 22 takes the form of a conical tip 50, placed on an upper face 52 of the transversal wall, opposite the side wall 26 of the cover sleeve. Said removable part is placed approximately in the middle of the transversal wall 28, so as to
15 cover the central bore, and is held against the upper wall by breakable pins 25 which form retaining means 24. Here, the breakable pins are placed transversally between the end of the removable part and the edge of the central bore, in the plane of the flange. This arrangement makes the assembly easy to demold.

20 The conical shape of the removable cover part is complementary to that of the dispenser tip and, advantageously, complementary to the shape and dimensions of a cap 36 placed on the dispenser tip prior to final assembly of the bottle.

When the cover cap is placed over the bottle via the open
25 end of the side wall of the sleeve, the transversal wall comes into contact with the upper face of the flange, while the central bore allows the dispenser tip to pass through, and the removable part of the cover cap is positioned around the dispenser tip 12 and the cap 36 placed on the tip in a previous step.

30 The wall delimiting the conical shape of the removable cover part has blisters 56 on the inside. When the cover cap is inserted over the bottle and the removable cover part covers the cap on the dispenser tip, the blisters, which locally reduce the inside

diameter of the removable cover part, compress the cap. As a result, when the cover cap is removed for the first time and the retaining means are broken by turning the removable cover part in relation to the cover sleeve, the cap is pulled inside the removable
5 cover part by friction so that, when the removable cover part is removed, the cap covering the tip is also removed and remains inside the cover cap. Gripping means could be provided on the outside surface of the removable cover part, such as the ribs 58
illustrated by way of example in figure 3, such that manipulation of
10 the tip cap by said removable cover part is facilitated.

The cover cap is mounted by inserting the bottle through the free open end of the sleeve 30 until the transversal wall 28 of the sleeve comes up against the pump flange, as shown in figure 3. The dispenser tip 12 of the bottle and, where required, a cap 36
15 placed on the tip, thus pass through the central bore of the transversal wall. The bottle is held axially by binding pins 34.

Figures 1 and 2 show a bottle with a particular cover cap in that the sleeve is of a single piece and that, in accordance with each of the embodiments of the invention, it has an upper face to which a
20 removable cover part is added.

We will now describe a second embodiment illustrated in figure 3. Since the bottle has a structure similar to that of the bottle described above, identical elements in the following description will be assigned the same numerical references, prefixed by 100.

25 The bottle has a reservoir 102, a distribution head 104 mounted on the reservoir, and a cover cap 106. In this embodiment, the cover cap 106 has a specific cover sleeve.

The cover sleeve consists of two parts 40, 42, designed to slide axially along the reservoir towards each other when the radial
30 tabs 132 on each part as per the previous embodiment, are pressed. When the two parts move towards each other, the pump system is actuated and the drop is dispensed. It is understood that the radial tabs are curved for good gripping and that the curves face in

different directions because, in order for the two parts to move towards each other, they must slide in opposite directions.

Here an upper part 40 and a lower part 42 of the cover sleeve are defined by their relative position when the bottle is placed vertically as illustrated in figure 2.

The upper part of the cover sleeve 40 comprises a side wall 43 whose upper end is extended transversally by a transversal wall 128 and whose lower end is extended axially by a collar 44, so that its outside diameter is greater than the outside diameter of the rest of the upper part. The collar is hollow to leave a passageway for the side wall of the lower part of cover sleeve 42 between the wall and the bottle.

A groove 46 is made axially in the collar of the upper part and a lug 48 is made axially on the side wall of the lower part in order to form axial guides for the two parts of the cover sleeve as they slide one with respect to the other. It is observed that they also provide a means to prevent the upper part from rotating in relation to the lower part.

As illustrated in figure 3, the removable cover part 122 takes the form of a conical tip 150, placed on the transversal wall 128 of the upper part 40 of the cover sleeve so as to cover the dispenser tip as before and, advantageously, the cap 136 placed on the dispenser tip prior to final assembly of the bottle.

The removable cover part can be different from that described above but it will be useful once again if it has ribs 158 on the outside surface and at least one blister on the inside.

The combination of a two-part cover sleeve and the removable part covering the dispenser tip results in good gripping when the removable part is removed, as in the previous embodiment.

The removable part can only be removed if it is turned while the sleeve covering the cover cap is held in position. In the

first embodiment, the user will understand that, in order to remove the cover cap, one hand must be placed on the removable part and the other hand on the cover sleeve and not on the reservoir of the bottle when it is accessible. In the second embodiment, regardless
5 of where the user places the second hand, the bottle will not rotate independently of the cover cap because of the lug which prevents one part of the cover cap from rotating in relation to the other, so they are guided axially only.

We are now going to describe a third embodiment
10 illustrated in figures 4 to 7. Since the bottle in the third embodiment has a structure similar to that of the bottles described above, identical elements in the following description will be assigned the same numerical references, prefixed by 200.

The bottle according to this embodiment mainly differs from
15 the previous embodiments in the shape of the removable part 222. Said removable part once again has a conical tip 250, specific here in that it is partial, that is, it is open at the end 60 opposite the sleeve, so as to only form one conical portion. When the cover cap is placed over the bottle, the end 236 projects beyond the conical
20 tip.

The removable part 222 also differs in that the tip has stiffening ribs 62 which extend axially around the tip. Said ribs make the removable part easier to grip and facilitate transmission of the effort required by the user to break the retaining pins, which are not
25 visible in figures 4 to 7. Furthermore, the axial arrangement of the ribs tends to encourage the user to rotate the conical tip and the fact that said ribs extend over only a portion of the cone, and therefore over only one part of the height of the cap, forces the user to target the rotating action at the base of the tip, next to the
30 retaining means which makes it easier to break the pins forming said retaining means.

It will be understood that although the different embodiments have been described with a conically shaped tip, whether partial or not, a different external shape can also be

proposed without going outside the scope of the invention, it being understood that the inside shape must necessarily cover the dispenser tip and the associated cap.

It can also be observed that the axial guides for the two parts of the cover sleeve 240, 242 differ from the previous embodiment in that the upper part 240 has a slotted hole 64 on its lower edge, unlike the groove 46 in the previous embodiment. Lug 248 supported by the lower part 242 of the cover sleeve is sufficiently elastic for it to change shape in order to pass over the lower edge of the upper part when the two parts are moved towards each other and be slotted into said hole. It is observed that axial retaining means are thus formed for the two parts covering each other.

The bottle to contain a liquid which has just been described in each of the above embodiments has the advantage of being able to be manufactured in distinctly successive stages. The first stage comprises the manufacture and assembly of a reservoir and a distribution head including a pump system, an axially actuating piston, and a dispenser tip that moves at the same time as the movable piston portion and through which the liquid is dispensed. During the second stage, under sterile conditions, the dispenser tip is closed with an airtight cap and the reservoir is filled with liquid before airtight closure of said reservoir.

Advantageously, the subsequent stages, during which the cover cap, manufactured elsewhere, is mounted, can then be carried out under conditions that are not necessarily sterile. The cover cap is placed over the bottle. The removable cover part, attached to the cover sleeve by the breakable retaining means, is placed at the same time over the bottle, ready to be removed by breaking the retaining means before the bottle is used for the first time. As described previously, said removable part provides an indicator that the bottle has been used. The user knows that the bottle considered has already been used if the removable part has been removed or if the removable part is no longer attached by the breakable means.

Patentkrav

1. Flaske for pakking av væske, omfattende et reservoar (2; 102) på hvilket det monteres et dispenserhode (4; 104) som omfatter en aksialt flyttbar del (16) for et væskestartpumpesystem og en dispenseringsdyse (12) begrenset til bevegelse med den flyttbare pumpedelen og gjennom hvilken væsken leveres, den flyttbare delen har en mansjett (18) til en toppoverflate som dispenseringsdysen er festet på, **karakterisert ved at** den omfatter et deksel (6; 106) dannet av en hylse (20; 40, 42; 140, 142) som dekker den flyttbare delen for aktivering av pumpen og en avtakbar del (22, 122; 222) for dekke av flaksen, hylsen omfatter en sylindrisk lateral vegg (26; 126), toppenden på hvilken forlenges av en tverrgående vegg (28; 128) som er egnet for å hvile på toppoverflaten til hylsen og som har et midtborehull (30) som gjør at dysen kan passere, den avtakbare delen av dekselet holdes på den tverrgående veggen til hylsen av en holdeanordning (24; 124) som kan brytes når flasken først tas i bruk, slik at den avtakbare delen av dekselet dekker midtborehullet, motsatt den laterale veggen til hylsen (26; 126), når den holdes på den tverrgående veggen (28; 128) til hylsen, og slik at midtborehullet og dispenseringsdysen frigjøres når den avtakbare delen av dekselet (22, 122, 222) fjernes etter brekking av holdeanordningen.
2. Flaske ifølge krav 1, **karakterisert ved at** enheten som holder den avtakbare delen av dekselet på den tverrgående veggen til hylsen (28, 128) dannes av holdepigge (25) som kan brytes ved dreining av den avtakbare delen av dekselet (22, 122, 222) med hensyn til hylsen når flasken først tas i bruk.
3. Flaske ifølge krav 2, **karakterisert ved at** de brekkbare piggene (25) arrangeres på tvers mellom enden av den avtakbare delen av dekselet og enden av hylsen som avgrenser midtborehullet, i planet for hylsen som aktiverer pumpen.
4. Flaske ifølge et hvilket som helst av de foregående kravene, **karakterisert ved at** den avtakbare delen av dekselet har en konisk endestykkeform (50, 150) komplementær til formen på dispenseringsdysen (12) og en hette (36) som dekker den, den avtakbare delen omfattende fremspring (56) på den innvendige overflaten til veggen som avgrenser dens koniske form.

5. Flaske ifølge foregående krav, **karakterisert ved at** det koniske endestykket som danner den avtakbare delen av dekselet, har en konisk formet del (250) under hvilken hetten (36) stikker frem, projiserende fra enden (60) motsatt den tverrgående veggen til hylsen.
6. Flaske ifølge det foregående kravet, **karakterisert ved at** den koniske delen (250) har aksiale avstivningsribber (62) på den utvendige overflaten.
7. Flaske ifølge et hvilket som helst av de foregående kravene, **karakterisert ved at** dekselet (6; 106) omfatter klikk-på-middel (34) arrangert på den innvendige overflaten til den laterale veggen (26; 126) til hylsen, for fanging av hylsen (18) mellom disse klikk-på-midlene og den tverrgående veggen til hylsen (28; 128).
8. Flaske ifølge et hvilket som helst av de foregående kravene, **karakterisert ved at** den tverrgående veggen til hylsen (28; 128) strekker seg radially utenfor hylsen ved en gripefinne (32; 132).
9. Flaske ifølge et hvilket som helst av de foregående kravene, **karakterisert ved at** den laterale veggen til hylsen (26; 126) strekker seg aksialt slik at den dekker hylsen (18) og minst en del av reservoaret (2; 102).
10. Flaske ifølge krav 9, **karakterisert ved at** den tverrgående veggen (28; 128) til hylsen strekker seg radially utenfor hylsen ved en gripefinne (32; 132) og ved at den laterale veggen (26; 126) til hylsen strekker seg aksialt langs reservoaret (2; 102) under finnen, flasken omfatter middel for låsing av dekselet med hensyn til rotasjonen i forhold til flasken, som tilpasses slik at i den låste vinkelposisjonen til dekselet strekkes den laterale veggen til hylsen langs reservoaret under gripefinnen og på en side av flasken motsatt en side reservert for klikking på flasken.
11. Flaske ifølge et hvilket som helst av de foregående kravene, i hvilken hylsen som dekker flasken omfatter to deler som glir med hensyn til hverandre, en toppdel (40; 240) som dekker den flyttbare delen for aktivering av pumpen og en bunndel (42; 242) som dekker bunnen av reservoaret, de to delene har radiale finner (132) for griping av flasken, og hvori de to glidende delene låses med hensyn til rotasjonen i

forhold til hverandre, den avtakbare delen av dekselet festes til toppdelen av hylsen ved en holdeanordning (24) som kan brekkes ved rotasjon av den avtakbare delen av dekselet med hensyn til hylsen når flasken først tas i bruk.

12. Flaske ifølge krav 11, **karakterisert ved at** den omfatter et middel (64-248) til aksialt å holde de to dekkende delene med hensyn til hverandre.

13. Fremgangsmåte for fremstilling av en flaske til pakking av væske ifølge et hvilket som helst av krav 1 til 12, hvori:

- under sterile betingelser, reservoaret (2; 102) fylles med væske og deretter monteres dette reservoaret (2; 102) forseglende med væskedispenserhodet (4; 104), hodet bærer væskestartpumpesystemet, den aksialt flyttbare delen (16) for aktivering av pumpesystemet, væskedispenseringsdysen (12) begrenset til å bevege seg med den flyttbare delen og en hette (36; 136; 236) som dekker dysen; og

- for det andre, under betingelser som ikke nødvendigvis er sterile, arrangeres dekselet (6; 106) dannet av hylsen som dekker den flyttbare delen for aktivering av pumpesystemet og den avtakbare delen av dekselet, holdt på hylsen av den brennbare holdeanordningen (24) som dekker flasken og hetten (36; 136; 236) som dekker dysen.

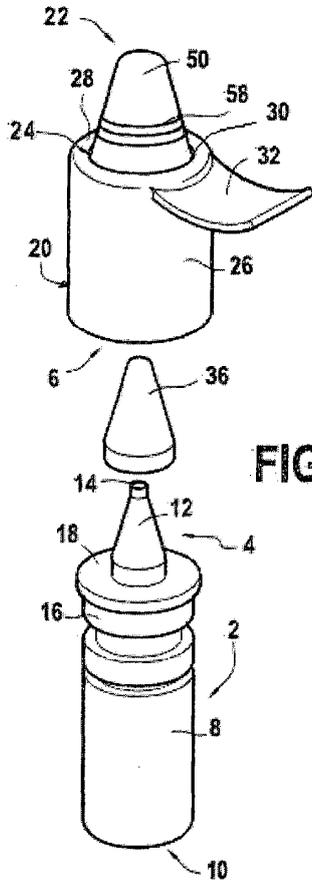


FIG.1

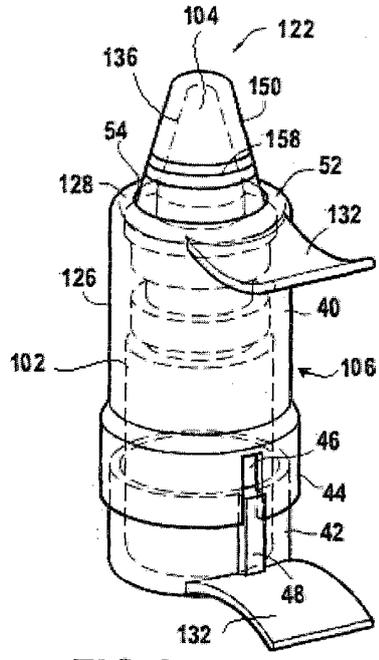


FIG.3

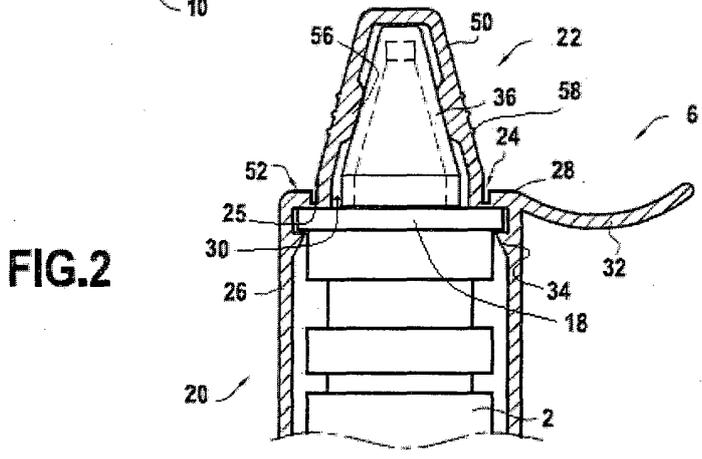


FIG.2

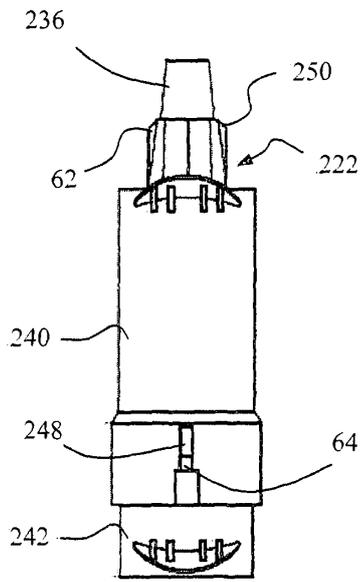


FIG. 4

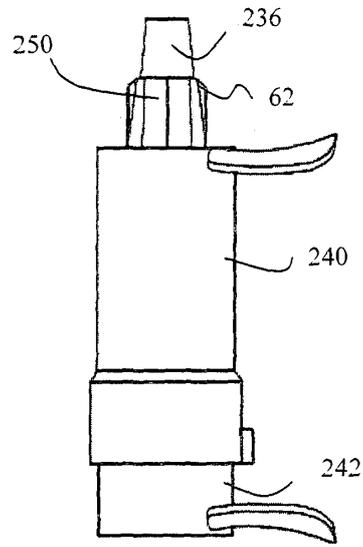


FIG. 5

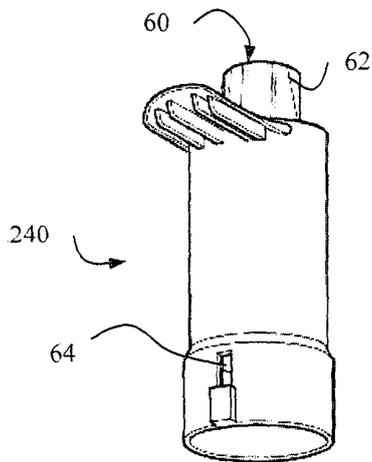


FIG. 6

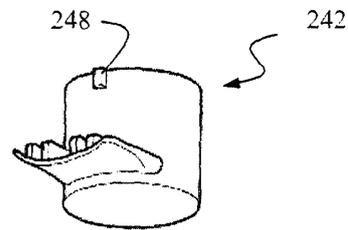


FIG. 7